

FGD Implementation status and Challenges



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1 Environmental Norms & Chronology of Norms

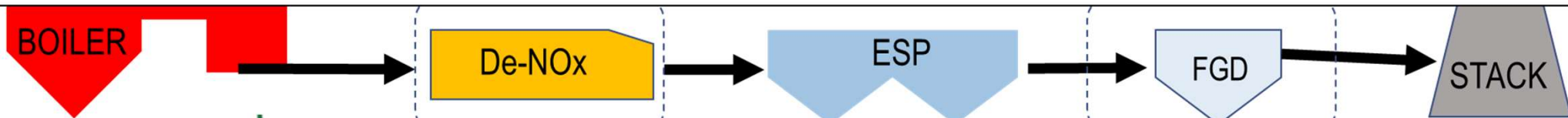


Change in Environment Norms issued on 07/12/2015

Previous Norms		New Norms				
<i>All emission are in mg/ Nm³</i>		Installed before 31.12.2003		Installed after 01.01.2004 & up to 31.12.2016		To be installed from 01.01.2017
Unit Size	All	< 500 MW	≥ 500 MW	< 500 MW	≥ 500 MW	All
SO ₂	Dispersion through Chimney	600	200	600	200	100
NOx	No Norms	600		450*		100
SPM	100	100		50		30
Mercury	No Norms	--	0.03	0.03		0.03

- All plants with once through cooling shall install Cooling Tower and achieve spec water consumption max 3.5M3/MW hr
- New plants to be installed after 01.01.2017 shall meet max specific water consumption limit 3.0 M3/MW hr and achieve ZLD

* Amendment issued on 19.10.2020

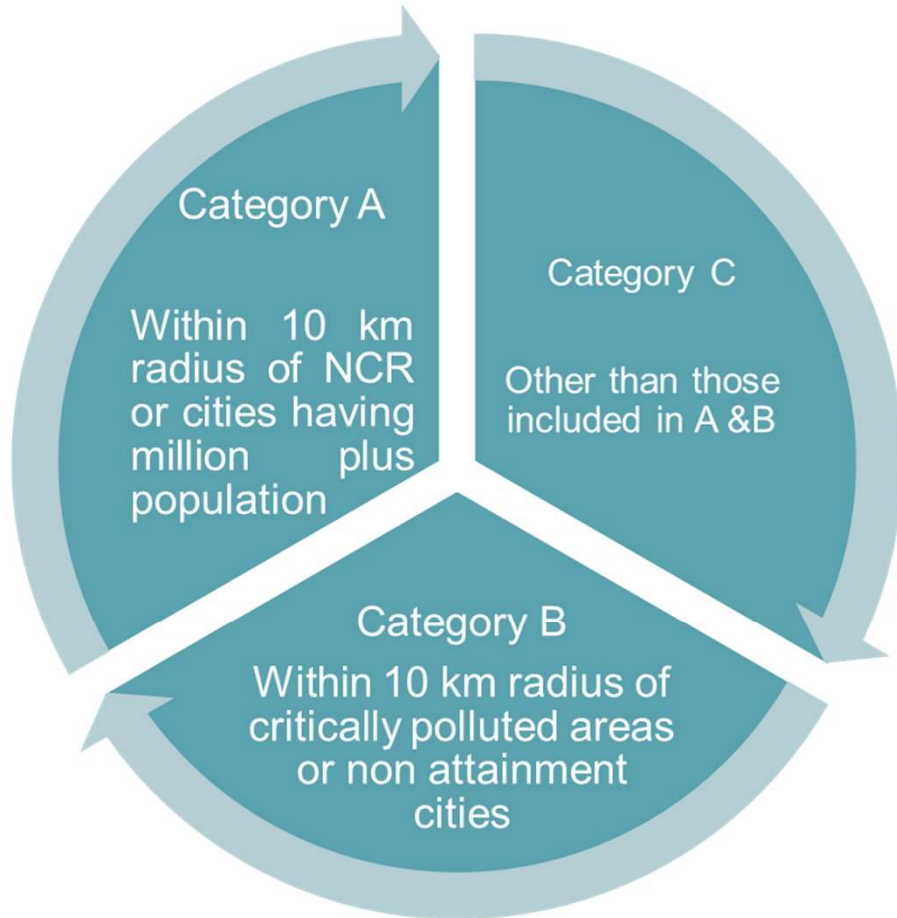


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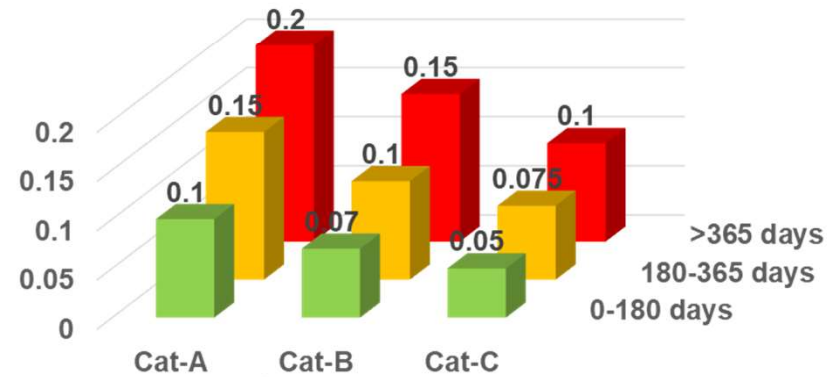
Latest MoEF Notification & its Impact



Timelines for Compliance as per MoEF Notification 31.03.21



Environment Compensation Rs/unit of electricity Generated



FINAL CATEGORISATION BY THE TASK FORCE



CATEGORY	SECTOR						TOTAL	
	CENTRAL		STATE		PRIVATE			
	UNIT	CAPACITY (MW)	UNIT	CAPACITY (MW)	UNIT	CAPACITY (MW)	UNIT	CAPACITY (MW)
Category A	16	6820	36	10120	15	3847	67	20787
Category B	20	7240	34	10955	18	5862	72	24057
Category C	133	53400	151	47086.5	177	66294	461	166780.5
TOTAL	169	67460	221	68161.5	210	76003	600	211624.5

Source-CEA as per 09.06.22

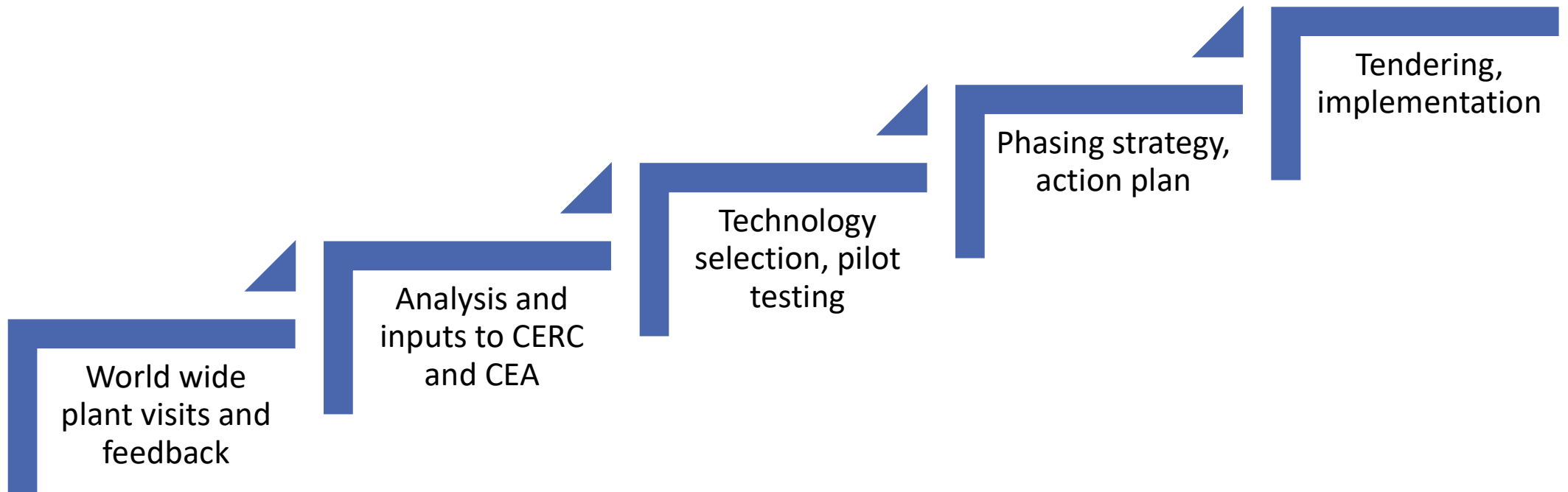


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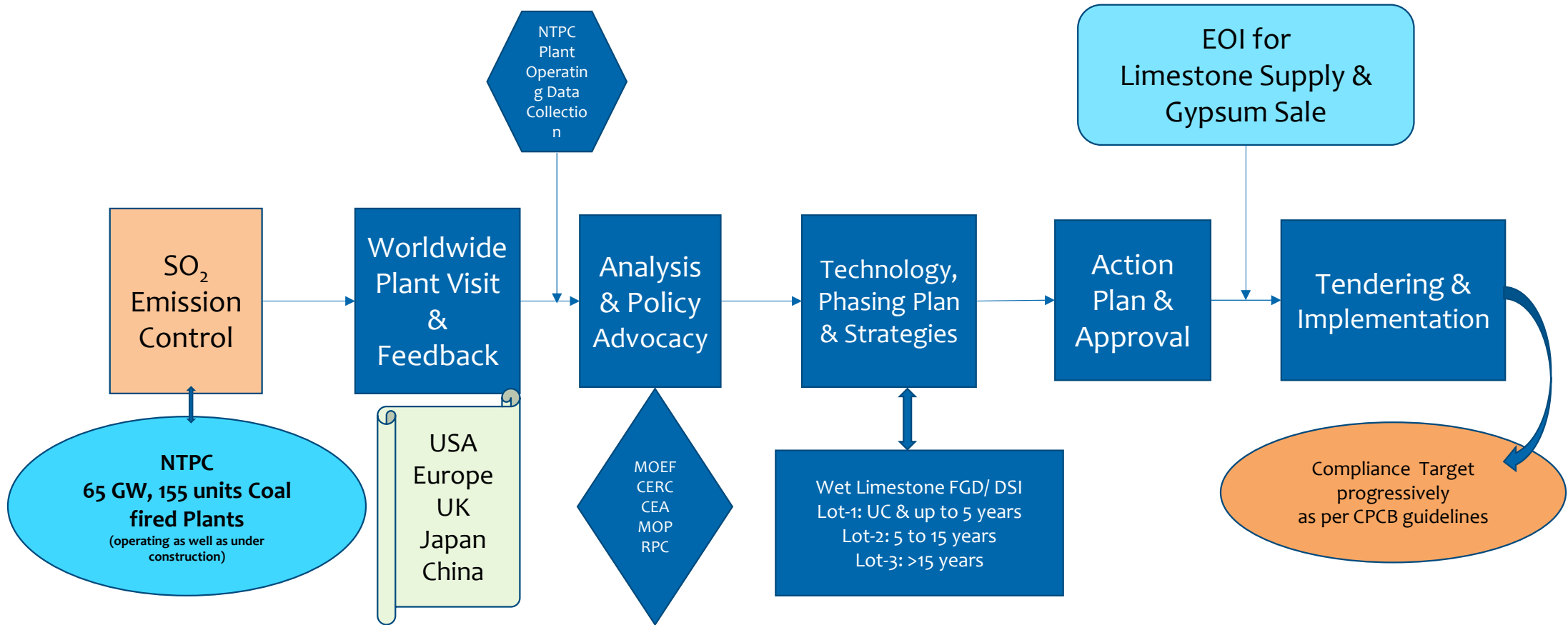
NTPC approach for Implementation



NTPC approach for meeting environmental norms



SO₂ Reduction Strategies & Planning



FGD Consultancy Assignment



Sl. No	Client
1	PSPCL
2	UPRVUNL
3	HPGCL
4	SCCL
5	NALCO
6	Bokaro
7.	DVC



3 FGD technologies and its Selection



SO2 Control Technologies and Selection



SO2 Efficiency Requirement

Unit Remaining Life

Plant Load Factor

Capital and operating costs

Reliability and space constraints

Suppliers

Supply chain, Ash Salability and disposal

Implementation Schedule



SO₂ Control Technologies and Selection



Technology	60-250 MW 600 mg/Nm ³	500 MW 200 mg/Nm ³	660 MW 200 mg/Nm ³	800 MW 100 mg/Nm ³	Remarks
Wet Limestone	✓	✓	✓	✓	<ul style="list-style-type: none"> Strong supply chain for input and by-product Good input availability
Sea Water					<ul style="list-style-type: none"> Suitable for coastal plants Open water cycle
Ammonia Based FGD					<ul style="list-style-type: none"> Mainly one Chinese Supplier High Ammonia required, safety hazards High Operation Risk
Circulating Dry Scrubber	✓	✓			<ul style="list-style-type: none"> Flue gas recirculation for load < 30-50% Many module needed for >660 MW Bag filter required Disposal of by product
Dry sorbent Injection	✓				<ul style="list-style-type: none"> Low Capex and High Opex Suitable for older units Low efficiency, Low PLF



Factors impacting FGD Cost

Cost of FGD System depends on the following factors:

- (i) Size of the unit and configuration
- (ii) Numbers of units
- (iii) Layout constraint
- (iv) Required SO₂ removal efficiency or target emission norm
- (v) Chimney layout as using existing chimney as wet stack, new wet stack with single or multi flue cans etc.
- (vi) Type of corrosion protection lining in chimney, absorber and other sections of FGD
- (vii) Progressive increase in demand of FGD equipment.
- (viii) Site Specific Factors soil condition wrt civil works
- (ix) General Inflation with Time
- (x) Steel price
- (xi) Corona Impact
- (xii) Commissioning Time Schedule
- (xiii) Gas Flow higher for smaller units comparison to new supercritical units for e.g. for combine 2 x 210 /200 MW is equivalent to 500 MW Unit.
- (xv) Duct length is more for all the projects where absorber of 2 or 3 units are provided common.



4 Challenges



Complexity and Volume involved with FGD



Huge Quantum in a short span (60 GW awarded in 2.5 years)

Sno.	Description	Remark
1	New Chimney with Lining	Limited Vendors
2	Complete Water System	
3	Limestone & Gypsum handling	
4	Absorber with Specific lining	Lining/Clad imported
5.	Duct with Specific Lining	
6.	Retrofit with in limited space	Enabling work Required
8.	Imported BOIs	
9.	Special Material	Imported
10.	Huge Civil works	Limited Vendors

- **FGD Scope requirement (Equipment and facilities) is comparable to 200MW thermal power plant.**
- **Typical FGD 2X500 MW-** RCC casting 40000 M3 and requirement of Major materials (in Metric Tonnes) are around 15000 steel, 25000 Cement & also required Special materials like Titanium and C276. The exact values are dependent on the unit-specific design aspects.

Overall Area for 2X500MW unit- around 6 Acre



Challenges in FGD Implementation



- **Implementation Priority changing due to various guidelines**
- **Detailed engineering /layout challenges for FGD :-**
 - No space provision for FGD was kept for unit installed before 2003 . Location and Space area kept for FGD in units after 2003 is lower than required for FGD
 - Running plant facilities shifting/relocation required to accommodate FGD.
 - Running Unit shut-downs for integrating FGD facilities (Dependent upon Grid condition).
 - Underground facilities pose surprises in old running stations.
- **Import restrictions from land border sharing country**
- **Limited Civil & Chimney Vendors**
- **Minimum local component condition under Atma Nirbhar Bharat**
- **Limited and foreign technology partner for FGD core equipment.**
- **Abnormally steep price rise in steel since Mar'20.**



➤ Impact of COVID-19

- Manpower Mobilization Issues due to Covid-19
- Equipment/material supply impact due to COVID-19
- Testing and Inspection process got affected during COVID-19
- Stoppage of Industrial Oxygen supply during COVID19 phase 2
- Expiry of items (shelf life) due to delay and labour issue





Thank you